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(56) Documents Cited

EP 0459384 A1 US 4531228 A US 4239936 A

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UK CL (Edition Q) G4R REX RHA RHB RPE RRL RRM**INT CL⁶ G10L 3/00 5/00 5/06 7/00 7/08 9/00 9/18****Online:WPI, EPODOC**

(54) Abstract Title

Data terminal with speech recognition function

(57) To prevent erroneous operation when a sound generated by moving or taking hold of a portable telephone set is inputted from a microphone after the start of speech recognition, recognition words for preventing erroneous operation due to noise are registered, and speech recognition is automatically started again when a recognition word for preventing erroneous operation due to noise is recognized after the recognition start.

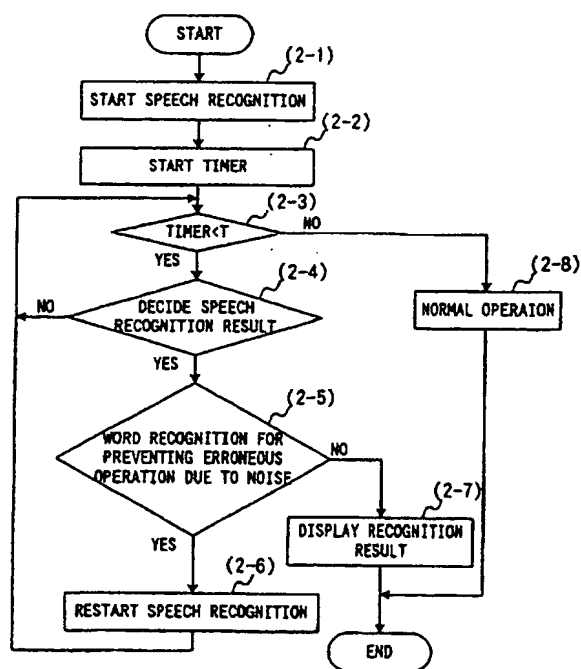
FIG.2**GB 2 343 779 A**

FIG.1

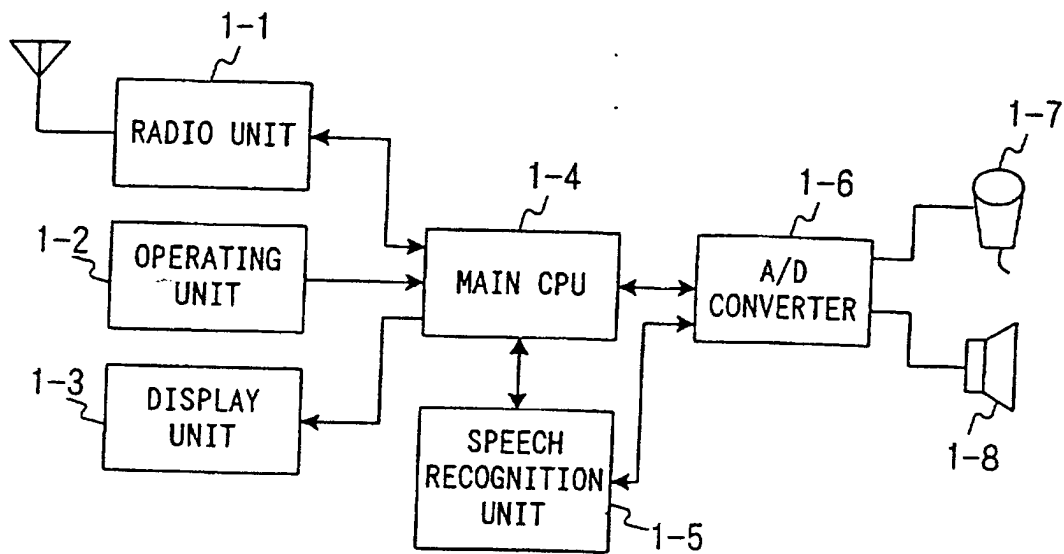


FIG.2

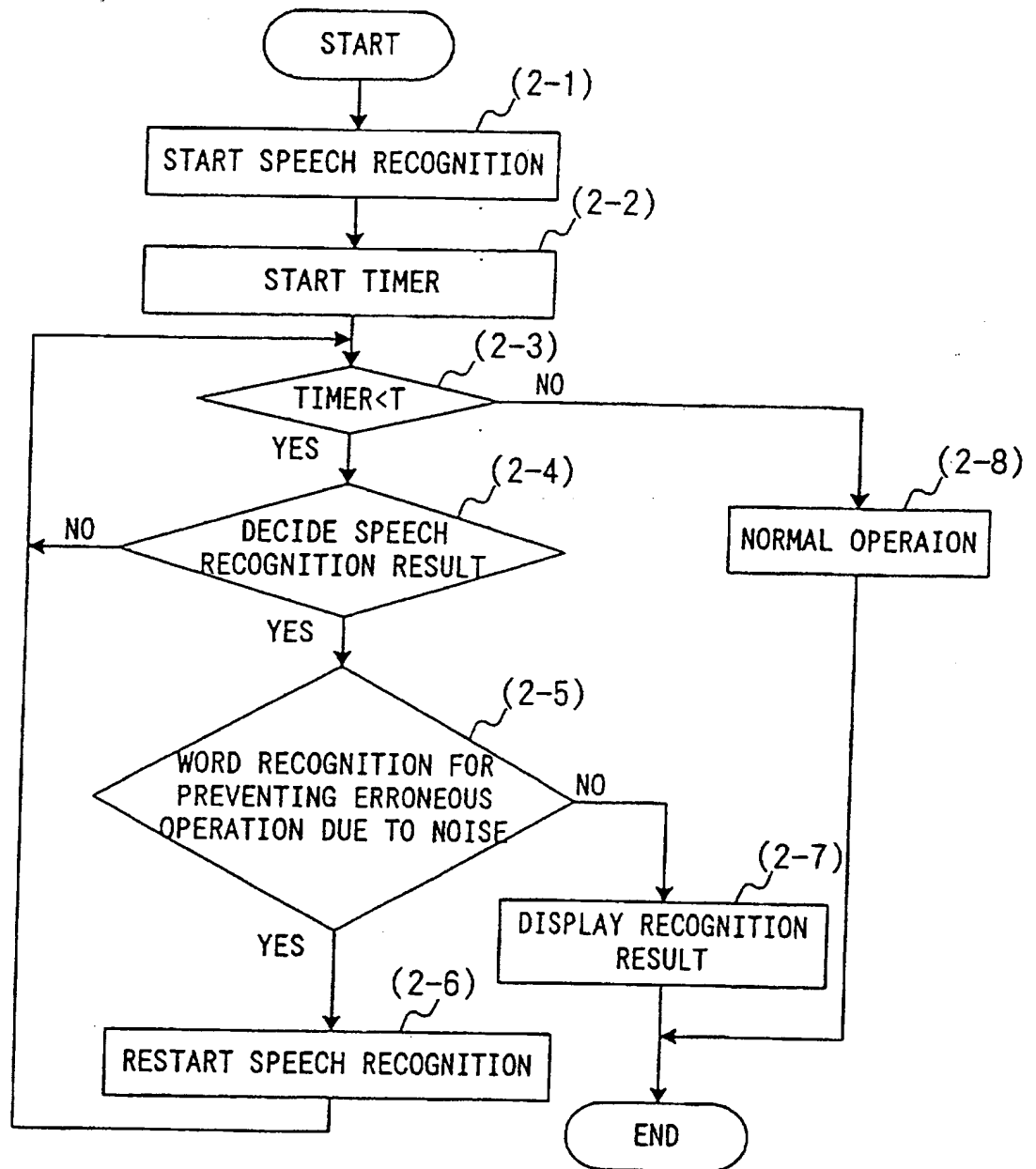
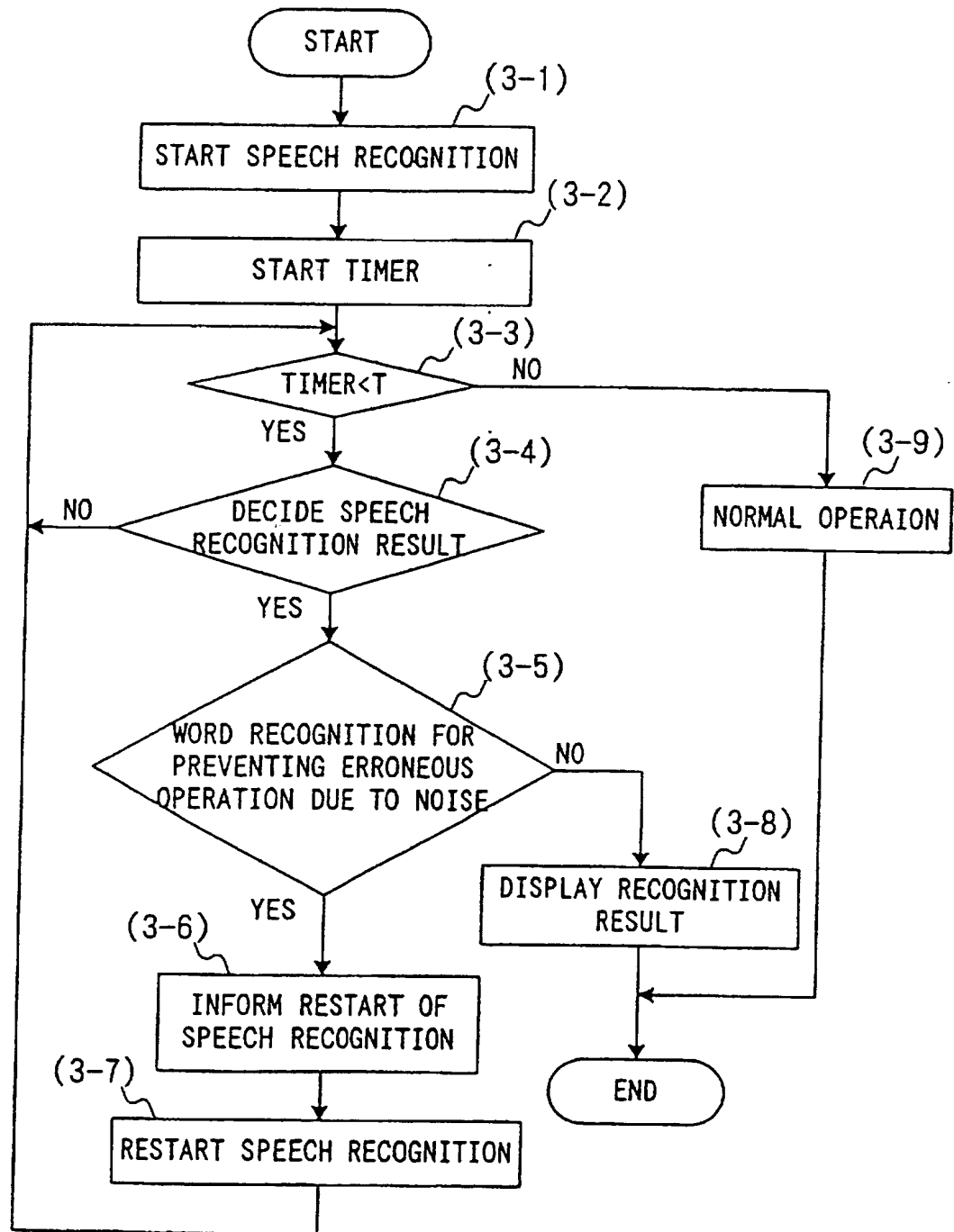


FIG.3



- 1 -

DATA TERMINAL WITH SPEECH RECOGNITION FUNCTION,
AND SPEECH RECOGNITION SYSTEM

BACKGROUND OF THE INVENTION

5 The present invention relates to data terminals with a speech recognition function, and to a speech recognition systems. More particularly, the invention relates to a portable data terminal and speech recognition system having a speech recognition function.

10 In a recent portable telephone set, a speech recognition function is utilized without operating the ten keys of the keypad. The speech recognition is performed for the name of the destination party spoken through a microphone.

15 In such a portable telephone set, a voice or speech to be recognized is first of all registered through the microphone. When a voice or speech which is recognized to be the same as the registered voice or speech is generated, a call-making or like operation is performed.

20 Such a portable telephone set may be used in any place as its service area, so that it may be used in noisy places or high noise level places. In such a case, ambient noise or noise sounds may be added to speech inputted from the microphone when making a call or the like. This may result in failure of detection of coincidence of the inputted voice with a registered voice, or erroneous judgment that the
25 inputted voice is coincident with a different voice.

To solve such a problem, it would be possible to register words for the speech recognition in a high noise level place. Also, it would be possible to end the speech
30 recognition process when it is judged that noise is inputted.

By adopting either one of these two methods, it would be possible to prevent erroneous speech recognition even in the case when the ambient noise level is high. However, it
35 is impossible to prevent erroneous speech recognition under

the noisy condition after the start of the speech recognition as a result of bringing the microphone of the portable telephone set to be closer to the mouth or bringing the loudspeaker into contact with the ear for listening to the speech from the loudspeaker. In such case, it is necessary to start the speech recognition once again by executing a speech recognition starting operation.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided a portable data terminal comprising: a microphone for inputting speech; a memory for registering speech recognition words in advance; and speech recognition means for executing speech recognition with respect to speech inputted from the microphone and reading out a speech recognition word corresponding to the inputted speech; in which speech recognition is prohibited when noise other than speech is detected at the time of the speech recognition.

The portable data terminal preferably further comprises registering means for preliminarily registering patterns for pulling in noise.

The portable data terminal preferably further comprises means for informing, when noise other than speech is detected, that the speech recognition is prohibited.

In the portable data terminal, the detection of noise other than speech is done within a predetermined period of time from the instant of the start of speech recognition.

According to a second aspect of the present invention, there is provided a speech recognition system for recognizing an input sound in which words to be recognized and predetermined noise sounds are preliminarily registered as recognition subjects and noise, respectively, and when the input sound is recognized as noise, the recognition is not performed or the recognition result is ignored.

According to a third embodiment of the present invention, there is provided a speech recognition system for recognizing an input sound in which words to be recognized

and predetermined noise sounds are preliminarily registered as recognition subjects and noise, respectively, the recognition process is performed after lapse of a predetermined time, and when the input sound is recognized as noise, the recognition is not performed or the recognition result is ignored.

In the speech recognition system, when the input sound is recognized as noise, the recognition process may again be performed, and when the input sound is recognized as noise, its recognition result may be displayed or produced as speech.

In the speech recognition system, the noise recognition is preferably performed within a predetermined time.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example in the following description with reference to the accompanying drawings, in which:

Fig. 1 is a view showing the construction of a portable telephone set as a typical portable data terminal embodying the present invention;

Fig. 2 is a flowchart showing the operation of the embodiment of the present invention; and

Fig. 3 is a flow chart showing the operation of another embodiment of the present invention.

PREFERRED EMBODIMENTS OF THE INVENTION

Preferred embodiments of the present invention will now be described with reference to the drawings.

Fig. 1 is a view showing the construction of a portable telephone set as a typical portable data terminal embodying the present invention.

Referring to Fig. 1, the illustrated construction comprises a radio unit 1-1 for transmitting and receiving the radio signal to and from a base station (not shown), an operating unit 1-2 for causing portable telephone set

operation and also starting speech recognition, a display unit 1-3 for displaying numerals, characters, etc., a main CPU 1-4 for controlling the entire portable telephone set and also controlling the speech recognition LSI, a speech recognition unit 1-5, an A/D converter 1-6 for analog/digital converting speech data with respect to the speech recognition unit 1-5, a microphone 1-7 for inputting speech, and a loudspeaker 1-8 for producing a start tone at the time when speech recognition starts and also generating the recognition result in speech.

The speech recognition is started by depressing a speech recognition start key in the operating unit 1-2. When the speech recognition start key in the operating unit 1-2 is depressed, the main CPU 1-4 detects this speech recognition start key depression, and sends a speech recognition start command to the speech recognition unit 1-5. When the speech recognition unit 1-5 receives the start command from the main CPU 1-4, it executes a speech recognition process for the speech from the microphone 1-7. The voice signal from the microphone 1-7 is digitally converted in the A/D converter 1-6 and then inputted to the speech recognition unit 1-5 for the speech recognition. As recognition words used for the speech recognition, the user inputs desired words by key operation to the operating unit 1-2. Alternatively, the input may be performed by voice from the microphone 1-7.

In addition to the desired recognition words registered by the user, recognition words for detecting erroneous operation due to noise are registered by the main CPU 1-4 in the speech recognition unit. The registration is preferably done before shipment of the portable telephone set. Among the noises which may cause erroneous recognition are suddenly occurring noises such as collision sounds, for instance "bangs", and windbreaking sounds or handling noises generated by moving or taking hold afresh of the portable telephone set for inputting speech from the microphone right after the start of speech recognition. Patterns for pulling

in these types of noises are registered in advance as recognition words. When these noises are recognized at the time of the speech recognition, it is highly possible to erroneously recognize speech generated by the user. Therefore, in this case it is informed that speech recognition is now impossible.

Specifically, when a sudden noise is inputted from the microphone 1-7 at the time of the speech recognition, a recognition word for preventing (detecting) erroneous operation due to noise is recognized, and a message informing that noise is recognized is outputted to the display unit 1-3. As stated before it is conceivable that an erroneous operation results from the handling noise or the wind-breaking sound generated by taking hold afresh of or moving the portable telephone set for inputting speech from the microphone right after the speech recognition starts. Thus, when the recognition word for preventing erroneous operation due to noise is recognized within several seconds from the instant of the speech recognition starting, no recognition result is outputted to the display unit 1-3. Instead, the CPU 1-4 sends out a speech recognition start command again to the speech recognition unit 1-5 for starting the speech recognition process. Thus, the speech recognition process for the speech inputted from the microphone 1-7 is started again for preventing erroneous operation due to the generated noise right after the speech recognition start.

The operation of the embodiment of the present invention will now be described with reference to Figs. 1 and 2. When a speech input key in the operating unit 1-2 is depressed, the main CPU 1-4 detects the depression of the speech input key, and sends out a speech recognition start command to the speech recognition unit 1-5. Here, the recognition words which are recognized in the speech recognition unit 1-5 are those inputted by the user from the operating unit 1-2, those set as desired and inputted from the microphone 1-7 by the user, and those for prevention of

erroneous operation due to noise as registered by the CPU 1-4. Upon start of the speech recognition operation (step 2-1), the timer is started (step 2-2).

When T seconds as measured by the timer has elapsed (step 2-3), normal operation of speech recognition (step 2-8) is executed, that is, a process of recognizing speech inputted from the microphone 1-7 is executed. When the speech recognition result is ascertained, the recognition result is outputted to the display unit 1-3 and the loudspeaker 1-8 to produce the speech recognition result as speech.

When the recognition word for prevention of erroneous operation due to noise is recognized, a message that a recognition word other than those registered in a recognition dictionary has been recognized, is displayed on the display unit 1-3. When the speech recognition result is ascertained before the lapse of T seconds as measured by the timer (step 2-4), the CPU 1-4 executes a check process as to whether the speech recognition result is a word registered as desired by the user or a word for prevention of erroneous operation due to noise (step 2-5).

When the speech recognition result is a word registered as desired by the user, the speech recognition result is informed, that is, it is outputted to the display unit 1-3 to display it, and the loudspeaker 1-8 to produce the result (step 2-7) as speech. When the speech recognition result is the word for prevention of erroneous operation due to noise, the main CPU 1-4 sends a speech recognition start command once again to the speech recognition unit 1-5, thus restarting the speech recognition process (step 2-6).

When the word for prevention of erroneous operation due to noise is recognized before the lapse of T seconds as measured by the timer started after the speech recognition starts, the speech recognition is continuously restarted for the execution of the speech recognition process until a speech recognition word set as desired by the user is detected as the speech recognition result. Thus, it is

possible to prevent erroneous operation due to the handling noise or the wind-breaking sound generated by taking hold of the portable telephone set afresh or by moving the set right after the start of speech recognition.

5 A second embodiment of the present invention will now be described with reference to Fig. 3. When a speech input key in the operating unit 1-2 is depressed, the main CPU 1-4 detects the depression of the speech input key, and sends out a speech recognition start command to the speech
10 recognition unit 1-5. Upon start of the speech recognition (step 3-1), the timer is started (step 3-2). When T seconds as measured by the timer has elapsed (step 3-3), normal operation of speech recognition (step 3-9) is executed, that is, a process of recognizing speech inputted from the
15 microphone 1-7 is executed.

 When the recognition result is ascertained, the result is outputted to the display unit 1-3 and the loudspeaker 1-8 to display and produce the speech recognition result as speech. When the recognition word for prevention of
20 erroneous operation due to noise is recognized, a message that a recognition word other than those registered in the recognition dictionary has been recognized, is displayed on the display unit 1-3. When the speech recognition result is ascertained before the lapse of T seconds as measured by the
25 timer (step 3-4), the CPU 1-4 executes a check process as to whether the speech recognition result is a word registered as desired by the user or the word for prevention of erroneous operation due to noise (step 3-5). When the speech recognition result is the word registered as desired by the
30 user, the speech recognition result is confirmed, that is, the recognition result is outputted to the display unit 1-3, and the loudspeaker 1-8 to produce the result (step 3-8).

 When the speech recognition result is the word for prevention of erroneous operation due to noise, restarting
35 the speech recognition is informed to the user (step 3-6). To this end, a message informing the restarting of the speech recognition is displayed on the display unit 1-3, and

the loudspeaker 1-8 is caused to produce a speech recognition restart tone. The main CPU 1-4 further sends a speech recognition start command once again to the speech recognition unit 1-5, thus restarting the speech recognition process (step 3-7).

When the word for prevention of erroneous operation due to noise is recognized before the lapse of T seconds as measured by the timer started after the speech recognition start, it is informed to the user that the speech recognition is to be started again, and the speech recognition is restarted for the execution of the speech recognition process until the speech recognition word set as desired by the user is ascertained as the speech recognition result. Thus, it is possible to prevent erroneous operation due to a handling noise of windbreaking sound generated by taking hold of the portable telephone set afresh or by moving the set right after the speech recognition start.

In the above embodiment it is possible to display a message informing that a word other than those registered in a speech recognition dictionary has been recognized.

As has been described in the foregoing, speech recognition words for prevention of erroneous operation due to noise are registered as well as those registered as desired by the user. When the speech recognition word for prevention of erroneous operation due to noise is recognized right after the start of speech recognition, speech recognition is automatically started once again for preventing erroneous recognition. It is thus possible to prevent erroneous speech recognition due to noise right after the start of speech recognition, thus permitting improvement of the recognition performance and convenience of the speech recognition.

Also, when restarting speech recognition as a result of recognition of a speech recognition word for preventing erroneous operation due to noise right after the start of speech recognition, it is informed to the user that speech recognition is to be started once again. Thus, when

restarting the speech recognition, this can be informed to the user. It is thus possible to detect an initial word at the time of the speech recognition restart, thus permitting improvement of the recognition performance at the time of the restart.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the present invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. It is therefore intended that the foregoing description be regarded as illustrative rather than limiting. In particular, the present invention is not limited to portable telephone sets, but it is applicable to other terminals which can be used in a movable state and have a function of speech recognition; for instance, it is applicable to a PHS (personal handyphone system/cordless telephone), a pager, and an electronic notebook.

CLAIMS

1. A portable data terminal comprising:
a microphone for inputting speech;
a memory for registering speech recognition words in
5 advance; and
speech recognition means for executing speech
recognition with respect to speech inputted from the
microphone and reading out a speech recognition word
corresponding to the inputted speech;
10 in which speech recognition is prohibited when noise
other than speech is detected at the time of the speech
recognition.
2. A portable data terminal according to claim 1, which
further comprises registering means for preliminarily
15 registering patterns for pulling in noise.
3. A portable data terminal according to one of claims 1
and 2, which further comprises means for informing, when
noise other than speech is detected, that the speech
recognition is prohibited.
- 20 4. A portable data terminal according to any of claims 1
to 3, wherein the detection of noise other than speech is
done within a predetermined period of time from the instant
of the start of speech recognition.
- 25 5. A speech recognition system for recognizing an input
sound in which words to be recognized and predetermined
noise sounds are preliminarily registered as recognition
subjects and noise, respectively, and, when the input sound
is recognized as noise, the recognition is not performed or
the recognition result is ignored.

- 5 6. A speech recognition system for recognizing an input sound in which words to be recognized and predetermined noise sounds are preliminarily registered as recognition subjects and noise, respectively, the recognition process is performed after lapse of a predetermined time, and, when the input sound is recognized as noise, the recognition is not performed or the recognition result is ignored.
- 10 7. A speech recognition system as set forth in claim 5 or 6, wherein when the input sound is recognized as noise, the recognition process is again performed.
8. A speech recognition system as set forth in claim 5 or 6, wherein when the input sound is recognized as noise, its recognition result is displayed or produced as speech.
- 15 9. A speech recognition system as set forth in claim 5 or 6, wherein the noise recognition is performed within a predetermined time.
- 20 10. A speech recognition system, or a portable data terminal incorporating a speech recognition system, substantially as herein described with reference to the accompanying drawings.



Application No: GB 9926901.1
Claims searched: 1 to 10

Examiner: John Donaldson
Date of search: 24 November 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.Q): G4R(REX, RHA, RHB, RPE, RRL, RRM)

Int CI (Ed.6): G10L 3/00, 5/00, 5/06, 7/00, 7/08, 9/00, 9/18

Other: Online:WPI, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0459384 A1 (MATSUSHITA), see abstract, column 1, lines 1 to 12	1
X	US 4531228 (NOSO), see abstract, column 1, lines 1 to 12	1
X	US 4239936 (SAKOE), see abstract	1

X Document indicating lack of novelty or inventive step
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